

Managing the Challenge of IDID

Prevention and Cure With Diesel Fuel Additives



By Thomas Weyenberg and Deanna Murlin

Although the discussion in the industry has been relatively low key, the reality is that internal diesel injector deposits or IDID are a very real problem in today's fuel injection systems. When first developing, the results of IDID can be either subtle or unmistakable, but one thing is for sure - if left untreated, these menacing deposits can significantly reduce fuel economy, decrease engine power, increase emissions, and even lead to expensive injector failure and equipment downtime.

What's The Issue?

IDID is really a new twist on an old problem. Deposits at the tip of diesel injectors, known as nozzle coking, have been an issue for years. These 'conventional' nozzle deposits form in and around nozzle holes, disrupt the fuel spray pattern and result in inefficient fuel delivery. But today's equipment designs offer a new set of challenges, and fuel additive solutions that are effective against nozzle coking may not work against IDID.

Modern high pressure, common rail injector systems are more complex, with smaller, lighter, and more intricate moving components. While these new engine systems are designed to reduce emissions and improve fuel economy, they are far less forgiving of IDID build-up than in older vehicle models. Even a small layer of deposit can cause a major 'sticking' problem in today's advanced injector

systems where tolerances are extremely tight and the mass and inertia of moving injector parts is greatly reduced. Also, unlike in older engines, modern injectors are expected to accomplish as many as six pulses within a single injection cycle; knocking one of them off cycle due to injector sticking can have serious consequences.

Symptoms, Prevention and Cure

In a survey of 1500 fleet fuel purchasing decision makers, power and fuel economy are identified as the two most important attributes of a diesel fuel. Fleets depend on diesel fuel to help ensure their vehicles perform at their best, especially in new engine technologies that are developed to optimize power and fuel economy while adhering to strict emission regulations. Unfortunately, IDID issues can stand in the way of that happening.

Unless fuel injectors just stop working completely, fleet owners and operators may not even know they're having IDID problems. Some common indicators include hard starting, poor initial operability, rough idling or sluggish vehicle performance. IDID may cause such a gradual power loss that operators don't even notice, or problems may appear quite suddenly, such that an engine that runs fine in the afternoon may start poorly and idle rough the next morning. Sometimes, not until the consequences of reduced fuel economy show up in the fleet's bottom line is the problem identified.



Example of a cam driven unit injector and pintle which characterizes large internal moving parts in older injection systems. These internal components were likely not significantly affected by IDID.



Example of today's computer driven common rail injector and pintle shows how internal moving parts have become significantly smaller and lighter, making them much more susceptible to sticking due to even minimal IDID.

continued on page 20

There is a solution, however. The right deposit control additive technology can correct an existing IDID problem and prevent future deposits from starting. To cure the immediate problem, a high-concentration, rapid clean-up dose (usually in the form of a bottled additive product) can be used to chemically break down existing IDID, which is then safely passed through the combustion process. Often, one-tank solutions are effective. To prevent the problem from reoccurring, a maintenance level dose of bottled additive can then be used at regular intervals.

A premium diesel fuel that contains effective IDID removing additive technology can also be used to combat problems and prevent them from reoccurring. Regardless of the delivery system chosen, the additive package, whether in a bottle or already formulated in a premium diesel fuel, should be proven to inhibit both conventional nozzle coking and IDID deposits.

Ongoing Testing

Currently, there are no industry-standard tests to measure IDID. However, data from existing diesel nozzle coking engine tests, such as the Peugeot DW10 test, may provide guidance in development of future IDID tests. Lubrizol has duplicated the IDID problem using an engine test rig based on a John Deere 6.8 liter engine. The test is used to measure additive performance against four different variables: power loss; exhaust temperature changes; injector sticking and visual confirmation of deposits. The test also demonstrates the negative impact of IDID on fuel consumption. Fortunately, certain additive solutions have been proven to eliminate deposits and power loss in this test.

Fuel consumption concerns around ‘conventional’ nozzle tip deposits are also still relative. Field testing in a Kenworth™ T800 truck, equipped with a 10.8L Cummins ISM engine, has demonstrated fuel economy and fuel injector performance improvements with the use of premium diesel fuel containing additive technology that is capable of removing both IDID and nozzle tip deposits.

Make the Right Choice for a Healthy Engine

Several vehicle and equipment OEMs have already identified IDID as a major concern and supply their own bottled additive product to clean injectors to ensure optimal engine operation. Bottled additive is also available from several reputable non-OEM additive marketers. However, making the right additive choice to effectively perform in today’s engines shouldn’t be a guessing game. One way to identify quality products is to check the label and literature. One red flag is when deposit control performance is based solely on the Cummins L10 test, which has been obsolete for a decade.

To help ensure a product is capable of eliminating IDID problems, look for language ensuring products are formulated for total injector deposit control, such as “tested and proven to eliminate both conventional nozzle deposits and internal diesel injector deposits (IDID) in the most complex Tier 3 and Tier 4 engines, as well as being equally effective in older diesel engines.”

Conclusion

IDID is a problem that is not going away. And it is not limited to North America. As engine manufacturers become more global in their designs, there isn’t as much variation in engine technology as in years past. IDID may well be a worldwide epidemic stemming from what could turn out to be multiple causes, but it is treatable. The right bottled additive or premium diesel fuel can offer a highly effective solution to curing the problem and preventing it from happening again. However, because industry standards have not yet caught up to the IDID problem, fleet owners and operators will need to choose wisely when selecting a treatment option. Always check the label and literature to ensure that the products used are “tested and proven to eliminate both conventional nozzle deposits and IDID in both newer and older engines.” The Lubrizol® 9040 Zer0™ Series family of advanced deposit control additive technology is the proven solution that provides marketers with a highly effective chemistry for both bulk diesel fuel and aftermarket bottled additives. Lubrizol® 9040 Zer0™ works to eliminate IDID and conventional deposits in diesel engines old and new.



Thomas R. Weyenberg, Global Business Manager, The Lubrizol Corp.

Mr. Weyenberg is currently the Global Business Manager – Consumer Products, leading Lubrizol’s efforts in the automotive aftermarket. He has been with the Lubrizol Corporation for 25 years in a variety of functions, including Research and Development, Business Development

and Product Management. During his career he has worked in a number of areas of fuels and lubricants businesses. Tom has degrees in Chemistry and Liberal Studies from The University of Notre Dame, and an MBA from Case Western Reserve University.



Deanna Murlin, Product Manager, Lubrizol

As a product manager for diesel and gasoline additives in North America and Latin America, Ms. Murlin focuses on chemical solutions that improve the power, emissions, and fuel economy of today’s vehicles. She is responsible for overseeing a wide range of products along with supporting fuel additive customers

to market high quality fuels. She holds a degree in Chemical Engineering from West Virginia University.



Billions of miles of proven performance.

Do your fuels realistically meet your marketing claims? They do when you partner with the additive leader. At Lubrizol, our additives undergo extensive lab and field testing, and are then further supported with real-world vehicle performance.

Our Lubrizol® 9040 Zer0™ Series brings the same powerful credentials. Testing demonstrates the elimination of performance-robbing injector deposits, including the most challenging internal diesel injector deposits. And since 2008, the real success of 9040 Zer0 is seen throughout billions of miles of actual use – enough for a truck to circle the globe several million times. That type of proven performance helps your fuels stand out from the rest. Visit 9040Zer0.com for more information.

With you every step of the way.

Lubrizol

www.lubrizol.com

©2011 All rights reserved.